Realtime Monitoring of Underground Sewage System using GPRS IoT Module

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Abstract:
A precautionary system avoids or eliminates the issue of sewage overflow on roads which is being a major problem in many cities. The level sensors are efficiently used and system is designed in a social relevant idea thus to create an impact on hygiene and cleanliness by simply avoiding the problem of overflow on streets and also to ensure compulsory cleaning of blockage which causes the increase the sewage level by registering repeated complaints to random departments unless action is taken. Over flow of sewage on roads is been a major problem in many developed and under developed cities as well. Sewage is generally considered as waste water. The response to the complaints is not properly answered or taken into account. A precautionary system is developed where this issue of sewage overflow can be reduced by early sensing of increase in its level. The system design comprises of a sensor to sense the level, a controller to command, a communication network to register the complaints on blockage and continues increase in the level of sewage. A data base is to be maintained to record the data. The system rather simply monitoring the level, it generates alarm signals via complaints to the required departments through mail and SMS regarding prior to overflow. The complaints will be auto launched prior to the overflow as soon as the level reaches the maximum set. The complaints would me registered repeatedly by the mechanism until the level reaches the minimum set. The entire system is controlled using a PIC micro controller.

1.INTRODUCTION:

Sewage or household wastewater is a type of waste water which is produced by a group of people. It is specified by volume, physical condition, and the chemical and toxic constituents present. It consists of mostly grey water from sinks, tubs, showers and black water which is used to flush toilets, combined with the human waste that it flushes soaps and detergents. Sewage usually moves from the plumbing area of a building into a sewer, which carries it into an onsite sewage facility of which there are many kinds depending on the sewer design (sanitary sewer or combined sewer). The reality is that most wastewater produced globally remains untreated causing widespread water pollution, especially in low-income countries. A global approximate by UNDP and UN-Habitat is that 90% of all wastewater generated is released into the environment untreated. In many developing countries the volume of domestic and industrial wastewater is frequently discharged lacking any treatment or seldom after primary treatment. Drainage conditions should be monitored in order to ensure its proper functioning. Not all areas have drainage proper monitoring teams which leads to irregular monitoring of the drainage condition that has a vast contribution on the clogging of the drainage that imply to the siltation which trigger flooding in the neighborhood. Manual monitoring is also ineffective. It needs a lot of dedicated persons who are only able to record limited report with low accuracy. These weaknesses lead to the slow handling for problems in drainage. To overcome such a complication an IoT based sewage level maintenance system is proposed, where the system uses a magnetic float sensor to detect and an Iot module to communicate. The maximum and minimum set level for the underground drainage system is set and it is being monitored by a magnetic float level sensor. This level sensor keeps tracking the level of the sewage and passes information on regarding to the municipal department, to the corporation and other governing departments via MAILS or SMS.

2. PROPOSED DESGIN:

In the method proposed, development of IoT based drainage maintenance is designed, where the sewage level is monitored using a magnetic float level sensor. The minimum and maximum levels are set and the level sensor keeps on monitoring the level of the sewage. As the level reaches the maximum set point, the float level sensor detects and send the signal to the raspberry pi where send commands the IoT network to generate alert complaints to the municipal and corporation departments in prior to overflow. The complaints will be repeatedly registered until the level reaches the minimum set. The communication is done based on IoT where the complaints are auto registered via mails or sms.

BLOCK DIAGRAM:
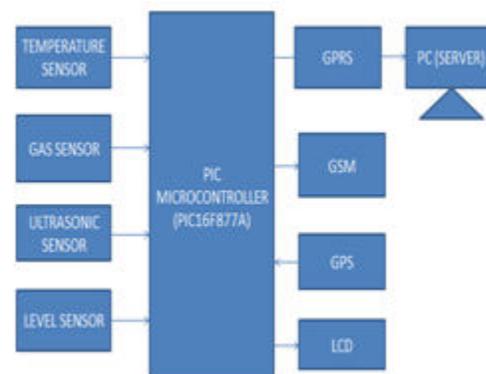
3.HARDWARES USED:

a. PIC MICROCONTROLLER:
A microcontroller (also microcontroller unit, MCU or μc) is a small computer on a single integrated circuit consisting of a relatively simple CPU combined with support functions such as a crystal oscillator, timers and etc. Microcontrollers are used in automatically controlled products devices, such as automobile engine control systems, remote controls office machines, appliances, power tools, and toys. A microcontroller is a small computer on a single integrated circuit containing a processor core, memory, programmable input/output peripherals used mainly for embedded applications. In our project, we use this powerful yet easy-to-program, CMOS FLASH-based 8-bit pic microcontroller which packs Microchip's powerful PIC architecture into a 40 pin package. For its low price, wide applications and easy availability it is used in industries, machine control, etc.

b.GPS MODULE-SKG13
GPS Receiver SKG13C with External Active Antenna is easy to use with PC or MCU. The Skylab SKG13 series is a complete gps receiver module that features super sensitivity, ultra low power and small form factor, Dual Power Source. The GPS signal is applied to the antenna input of module, and a complete serial data message with position, velocity and time information is presented at the serial interface with NMEA protocol or custom protocol. It is based on the high performance features of the Media Tek 3329 single-chip architecture, Its -165dBm tracking sensitivity extends positioning coverage into place like urban canyons and dense foliage environment where the GPS was not possible before. The small form factor and low power consumption make the module easy to integrate into portable device like PNDs, mobile phones, cameras and vehicle navigation systems. The SKG13C is a complete GPS engine module that features super sensitivity, ultra low power and small form factor. The GPS signal is applied to the antenna input of module, and a complete serial data message with position, velocity and time information is presented at the serial interface with NMEA protocol or custom protocol. It is based on the high performance features of the Media Tek MT3339 single-chip architecture, Its–165dBm tracking sensitivity extends positioning coverage into place like urban canyons and dense foliage environment where the GPS was not possible before. The small form factor and low power consumption make the module easy to integrate into portable device like PNDs, mobile phones, cameras and vehicle navigation systems.

c. GPRS IOT MODULE:
Internet of Things is an environment in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. IoT board featured with SIM900 GPRS modem to activate internet connection also equipped with a controller to process all input UART data to GPRS based online data. Data may be updated to a specific site or a social network by which the user can able to access the data.

4. SOFTWARE USED:

a.MPLAB COMPILER:
The MPLAB X IDE is the new graphical, integrated debugging tool set for all of Microchip's more than 800 8-bit, 16-bit and 32 bit MCUs and digital signal controllers, and memory devices. It includes a feature-rich editor, source-level debugger, project manager, software simulator, and supports Microchip's popular hardware tools, such as the MPLAB ICD 3 in-circuit debugger, PIC kit Tm 3,and MPLAB PM3 programmer. Based on the open-source Net Beans platform, MPLAB X runs on Window OS MACOS and LINUX, support many third-party tools, and is compatible with many Net Beans plug-ins. MPLAB Integrated Development Environment (IDE) is a free, integrated toolset for the development of EMBEDDED applications employing Microchip's PIC and DSPIC microcontrollers. MPLAB IDE runs as a32-bit application on MS Window, is easy to use and includes a host of free software components for fast applications developments and super-charged debugging. MPLAB IDE also serves as a single, unified graphical user interface for additional Microchip and third party software and hardware development tools. Moving between tool is a snap, and upgrading from the free software simulator to hardware debug and programming tools is done in a flash because MPLAB IDE has the same user interface for all tools.

b.EMBEDDED C:
Embedded c is a set of language extension for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems. Historically embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations. Embedded C uses most of the syntax and semantics of standard C, e.g., main() function, variable definition, data type declaration, conditional statements(if, switch, case),loops(while, for),functions, arrays and strings, structures and union, bit operations, macros, etc. During infancy years of microprocessor based systems,

programs were developed using assemblers and fused into the EPROMs. there used to be no mechanism to find what the program was doing. LEDs, switches, etc. were used to check for correct execution of the program .But they were too costly and were not quite reliable as well .As time progressed, use of microprocessor-specific assembly-only as the programming language reduced and embedded systems moved onto C as the embedded programming language of choice. C is the most widely used programming language for embedded processors /controllers.

5. CONCLUSION:

Proposed system is developed based on the hardware and the software which are MPLAB and Embedded C. Using this system we can identify various parameters such as the sediment contamination, solid waste, increase in the gas level and even the overflow which may occur in the manholes.

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